

Demonstration of UK Snake Arm Robotic Technology for Calcine Retrieval

PARTNERS



NuVision Engineering (NVE) and OC Robotics



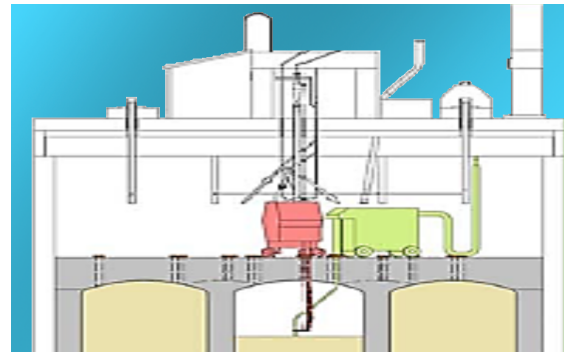
CH2M Washington Group Idaho (CWI) and Fluor Idaho

Technical Summary

There are approximately 4,400 m³ of radioactive calcined solids material, which was generated from processing high level radioactive liquid waste in a fluidized bed calcination system. The resulting material is stored in six Calcine Solids Storage Facilities (CSSFs) at the DOE Idaho site. Each CSSF contains from three to twelve stainless steel tanks, referred to as bins, surrounded by a concrete vault. The design of each is different, with the earlier binsets having substantially different configurations than the later designs (i.e., vault geometry, bin geometry.). Additionally, access to each is different and very limited, having access risers of only six-inches or eight-inches in diameter. In accordance with the Idaho Settlement Agreement (ISA), this waste has to be retrieved and prepared for shipment to final disposal by December 31, 2035. No decisions have yet been made on how the calcine wastes are going to be retrieved from the CSSF's. The objective of this project is to demonstrate that the OC Robotics-developed planar Snake Arm system can be adapted for this unique application such that it can meet the access and retrieval challenges associated with the unique physical constraints of the calcine binsets, in compliance with the regulatory and technical requirements of the ISA. In this task, NVE has collaborated with CWI, Fluor Idaho, DOE EM and OC Robotics to develop a conceptual design (see figure) of an integrated remote solution to retrieve calcine material from the binset feed tubes, size reduce and remove the feed tubes, install additional risers on the bins and then retrieve the calcine material safely and cost effectively.

Path Forward

- Based on the final conceptual design, a remotely-operated integrated large-scale test bed will be constructed to demonstrate multiple aspects of the technology.
- Demonstrate performance for the most challenging calcine retrieval scenarios, as well as adaptability to various CSSF configurations.



Conceptual Model of Planar Snake Arm and Hose Management System on CSSF 2

Key Accomplishments

- Developed a detailed Conceptual Design for an integrated remote system that can be used to size reduce and remove feed tubes from the in-vault area, gain access to each bin through existing or new risers and retrieve the calcine material.
- Worked in close collaboration with CWI, Fluor Idaho and DOE-Idaho to ensure the design approach took advantage of key site experience, met site safety and operations requirements and could achieve approval and acceptance from stakeholders and regulators.

Key Benefits

- Successful demonstration of this integrated remote approach, especially as it relates to its effective adaptation to the various configurations for the CSSFs, will provide a proven alternate approach for consideration during conduct of Analysis of Alternatives (AoA) for calcine retrieval. This is compliant with requirements of DOE O 413.3B, as well as recent direction from the Secretary of Energy regarding application of the AoA process.
- DOE EM leveraged significant UK investment in developing the Snake Arm technology. Although some adaptation to the application for retrieval from the CSSFs is necessary, this approach provides a more cost-effective and accelerated strategy for evaluation of technology options for addressing a recognized DOE EM challenge.
- This effort provides an opportunity to demonstrate the importance of the DOE National Robotics Initiative through a near-term application.